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USE OF LAND RESERVES TO CONTROL AGRICULTURAL PRODUCTION

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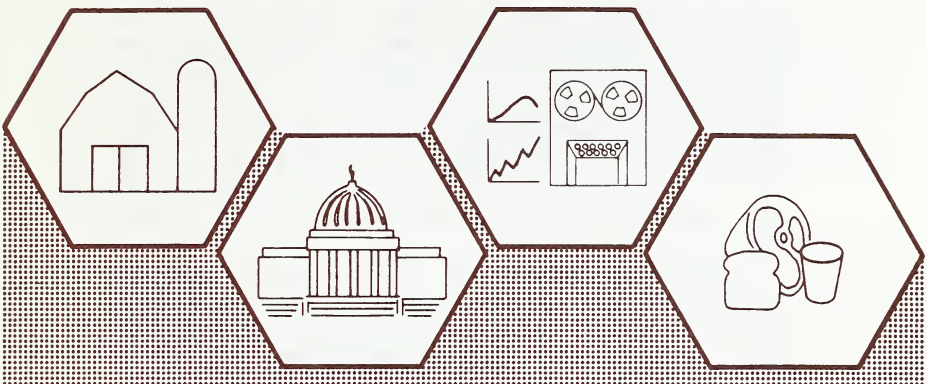

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USE OF LAND RESERVES TO CONTROL AGRICULTURAL PRODUCTION, by Milton Ericksen, Agricultural Policy Analysis Program Area, Commodity Economics Division, Economic Research Service, ERS-635.

ABSTRACT

A land reserve program is one instrument for achieving production adjustment. But the results of past programs have been less than expected because of "slippage." This term refers to the proportion of acreage put into a reserve for which there is no corresponding reduction in production of the crops being controlled. Slippage coefficients in land reserve programs during 1956-73 usually ranged between 0.4 and 0.5, implying a program efficiency rate of only 50-60 percent in reducing acreage. Acreage put into land reserve also tends to be less productive than acreage being cropped, thus further reducing program production abatement.

A land reserve program which would link base acreage to the previous year's crop acreage is discussed. Land reserve acres would be required to come from the land actually used for production of the controlled crop in the previous year.

One problem of such a plan would be that income supplements tied to annually updated bases might be an incentive for producers not to participate in the program for a year to establish a large base. The probability of this response would be decreased if income supplements were variable annually.

KEYWORDS: Land reserve, acreage reserve, production adjustment, slippage, agricultural and food policy.

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USE OF LAND RESERVES TO CONTROL AGRICULTURAL PRODUCTION

By Milton Ericksen*

INTRODUCTION

For 18 consecutive years, 1956-73, varying amounts of U.S. cropland were idled from the production of farm commodities. Terms for specific programs or particular provisions of commodity programs have included soil bank, acreage reserve, conservation reserve, cropland adjustment, cropland conversion, diversion, and set-aside. The amount of cropland idled under these various programs exceeded 60 million acres in 1962, 1966, and 1972. The set-aside provisions of agricultural programs in effect since 1973 have not been used.[1]

The major purpose for the land idling programs and provisions was to reduce the production of wheat, feed grains, and cotton. The acreage reserve, diversion, and set-aside programs were annual programs wherein the land withdrawn was committed to nonproduction use for 1 year at a time. The other programs allowed longer term commitments, ranging up to 10 years; and in some cases, they allowed whole farms to be retired. While these longer term programs were primarily aimed at reducing crop production, a secondary objective was to promote permanent conversion from crop use to pasture or forest uses, especially in cases where the land was marginally suited for grain crop use.

The purpose of this report is to examine the effectiveness of land reserve programs in reducing crop acres and to relate the effectiveness to the underlying mechanism for adminstering the programs. The slippage problem is treated first, followed by a discussion of rigidities in production adjustment introduced by allotments and bases. An alternative plan for administering land reserve programs is suggested and briefly elaborated.[2]

Information in this report may be pertinent if future conditions require policymakers to again consider land reserve as a policy instrument to effect production control. Treatment of this topic does not imply that use of land reserve is superior to other instruments for effecting supply control nor does it imply that some form of supply control may be needed in the future.

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[1]Some land contracts under the cropland adjustment program were not due to expire until after 1974. But, after 1973, farmers were allowed to break the contract if they wished. Approximately 2 million acres remained under contract in 1974.

[2]The term "land reserve" is used here to describe land withheld from production through programs whose primary objective is supply reduction.

THE SLIPPAGE ISSUE

Slippage Concepts

"Slippage" is a term often discussed in connection with the performance of land reserve in achieving the supply objective. Slippage refers to the proportion of acreage put into a reserve for which there is no corresponding reduction in production of the crops being controlled. The following examples show how slippage occurs in acreage and in production.

Let A_i^h* represent the acreage of crop 1 that farmers would harvest under a given set of program provisions without land reserve. Let A_i^h represent the actual acreage of crop 1 harvested under the same program with land reserve. Let L^1 equal the acreage of land designated as crop 1 land reserve. Slippage of harvested acreage for crop 1, S^h, is defined as:

$$S_1^h = 1.0 - \left[(A_1^h* - A_1^h) \div L_1 \right] \quad (1)$$

If $S_1^h = 0$, it means that crop acreage was reduced by 1 acre for each acre of land reserve, L_1. If $S_1^h = 1$, it would mean that the land reserve had no effect on the acreage of the crop.

Now let Y_1^h* be the yield that would have resulted with A_1^h* acres and Y_1^h be the actual harvested acre yield. Under these conditions production slippage, S_1^P, for crop 1, would be defined as:

$$S_1^P = 1.0 - \left[[(A_1^h* \cdot Y_1^h*) - (A_1^h \cdot Y_1^h)] \div [L_1 \cdot Y_1^h*] \right] \quad (2)$$

The objective of land reserve programs is to control production by limiting the land input, thus the reason for the definition of slippage on the basis of production. When production slippage is greater than acreage slippage ($S_1^P > S_1^h$), the land placed in land reserve may be less productive than the land remaining in production of crop 1. Another yield-related factor is that yields may increase ($Y_1^h > Y_1^h*$) because farmers apply inputs more intensively to the remaining land they are allowed to use for production. Values for S_1^h and S_1^P cannot be readily estimated because values for A_1^h* and Y_1^h* are not known. Estimates of A_1^h, Y_1^h. and L_1 are available only when a land reserve program is in effect.

Slippage equations (1) and (2) are developed on the basis of total acreage of crop 1, when, in practice, land reserve occurs only on participating farms which represent some fraction of the total. A slippage coefficient calculated on the basis of participants only may be different from one calculated for all farms. Nonparticipating farmers may believe the existence of a land reserve program has a positive influence on expected price of the particular commodity. Therefore, they may increase their acreage of the crop in response to a land reserve program. If this response occurred, the slippage coefficient for all farms wold be greater than the coefficient for participating farms only.

Slippage was defined for one crop in equations (1) and (2). A land reserve program aimed at a particular crop may affect other crops that may or may not

have separate land reserve programs. For instance, the value of A_2^{h*} for crop 2 may differ from the value of A_2^h when there is a land reserve program for crop 1. Such a difference indicates a cross effect.

A slippage coefficient for net harvested acreage can be defined by looking at the total land reserve acreage and the total acreage of all crops as defined in the following equation:

$$S^h = 1.0 - \left[\left(\sum_{i=1}^{n} A_i^{h*} - \sum_{i=1}^{n} A_i^h \right) \div \sum_{i=1}^{n} L_i \right] \quad (3)$$

A net production slippage coefficient is not defined in this report because of the difficulty of summing across different commodities.

It is evident, from observation of farm program performance with respect to land reserve programs, that slippage coefficients as defined in equations (1), (2), and (3) have a positive value. A positive slippage value is viewed as undesirable for two reasons:

First, acreage in land reserve status may be viewed as an intermediate-term food reserve by policy planners, domestic consumers, and foreign customers. It is quite tempting to assume that each land reserve acre for crop i can provide a future production increment, if needed, equal to an acre producing crop i. If there is a large production slippage coefficient, the actual reserve may be much less than the implied reserve, thus resulting in a false sense of security.

Second, from the individual farmer's standpoint, the existence of positive slippage coefficients means that some farmers' levels of program performance do not meet with the intent of the provisions. Farmers whose situation results in slippage can usually meet the land reserve requirements without having to reduce the acreage of their most profitable crop proportionally to the required land reserve acreage. Slippage as discussed here is not a result of fraud or willful disregard of rules, but rather bona fide situations that result within program provisions rules. The results: not only do farmers receive production adjustments payments for less than full performance but also the purpose of the program in the aggregate tends to be defeated. Inequity occurs among farmers because not all farmers have situations conducive to slippage. Also, cost effectiveness of the program may be reduced from what it could have been under conditions of no slippage.

Estimates of Slippage

Garst and Miller published an analysis with objectives of developing a predictive model for the planted acreage of wheat and obtaining a statistically accurate estimate of the impact of changes in land reserve acreage on the acreage of

wheat planted (*3*, p. 30).[3] They concluded that, during 1961-70, each acre of additional land reserve (diversion) reduced total wheat plantings about 0.61 acre. During 1971-73, each acre of wheat land reserve (set-aside) reduced planted acreage of wheat 0.41 acre (*3*, p. 36).

These reported measurements reflect the concept of equation (1) above, except that their measurements are in planted rather than harvested acres. Ignoring this difference, slippage coefficients would equal 0.39 and 0.59 for 1961-70 and 1971-73, respectively.

Sharples and Walker reported results from an analysis designed to account for the impact of two major factors on planted acreage in the North Central Region,[4] change in crop rotations over time, and cropland diversion. The overall purpose was to make shortrun predictions of planted acreage of row crops (corn and soybeans) and of extensive crops, given various levels of land reserve acreage (*5*, p. 106). They reported the following predictive equation estimated from 1961-72 data (*5*, p. 109):

Y_r = 84,184 - 22,746 (0.8748)T - 0.621 (DVRN) + 1260 (CFP)

where: Y_r = planted acres (in thousands) of row crops (corn and soybeans)

T = time expressed as 1961 = 1, 1962 = 2, ... 1972 = 12

DVRN = Acreage (in thousands) of wheat, feed grain, and cotton diverted

CFP = a zero-one variable representing change of farm programs in 1971 that eliminated planting restrictions on individual crops (1961-70 = 0, 1971-72 = 1)

Their predictive equation shows that each land reserve acre reduced the acreage of row crops by 0.621 acre. The bulk of the land reserve resulted from the feed grain program in the North Central area. Thus, the fact that wheat and cotton acreages were not included in the dependent variable, Y_r, but were included in the land reserve data, would have little effect on the land reserve coefficient. The implied slippage coefficient would be 0.379. Less slippage would be expected in the North Central region compared with other U.S. regions because the North Central region has virtually no fallow land and it has a much higher percentage of land in farms classified as cropland than do other regions.

Sharples and Walker estimated a similar equation for extensive crops (oats, wheat, barley, rye, flax, and hay). The DVRN variable had a coefficient of -0.124, indicating that land reserve also had some effect on these crops (*5*, p. 109). The sum of the two DVRN coefficients is 0.745. Slippage in the sense of equation (3) for all crops would be 0.255.

Houck and Ryan, in a report on the supply analysis of corn, defined a diversion variable that combines diversion payment rates and eligible diversion acreage. They used this variable as an independent variable in an equation to explain diversion, and the same variable in an equation to explain the planted acreage of corn. The coefficient for this variable was, they noted, about twice as large in the diversion equation as in the planted acreage equation (*4*, p. 190).

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[3] Italicized numbers in parentheses refer to items in References at the end of this paper.

[4] Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

They appraised this difference as resulting from "slippage," implying a slippage coefficient of roughly 0.5. Set-aside program years were not included in the analysis.

From an unpublished analysis of factors affecting the cropland acreage farmers use for crops, some additional insights emerge as to the magnitude of slippage (*1*). Cropland used for crops is defined to be the total acreage of cropland harvested plus the acreage of crop failure and the acreage of fallow land. To define the total cropland inventory, two additional categories must be added to cropland used for crops: (1) soil improvement crops and idle cropland and (2) cropland pasture.[5] Land reserve acreage should, by definition, be reflected as an addition to the soil improvement crops and idle cropland category and, conversely, as a direct acreage reduction in the cropland used category.

Through use of data for 1937-73, the following equation was estimated (*1*):

$$L_t = 346.8 - \underset{(.002)}{0.60}\ D_t + \underset{(.066)}{0.29}\ PR_{t-1} \quad R^2 = 0.95$$

where: L_t = total cropland used for crops (cropland harvested + crop failure + fallow), year t.

D_t = land in acreage reserve programs (includes both annual and long term programs), year t.

PR_{t-1} = the average annual parity ratio for the preceding year.

The numbers in parentheses are the standard errors of the estimated coefficients.

The model formulation uses the assumption that farmers plan their production response, including cropland use, based on expected returns. The parity ratio is the ratio of the indexes of prices received to prices paid; it measures the purchasing power of products sold by farmers in terms of things they buy compared with a base period. This variable lagged 1 year is used as an estimate of farmer's expectations for net returns for the current year. The land reserve variable picks up the effect that idled acreage has on cropland acres independent of net return expectations.

The estimated model equation explains a large percentage of the variation in total cropland used for crops. This model also reflects the slippage concept illustrated by equation (3) above. The implied slippage coefficient is 0.4.

Another indication of slippage is suggested by occurrences since 1973. When set-aside requirements were reduced in 1973 and eliminated in 1974, the acreage of feed grains, wheat, and soybeans which were in short supply did not increase proportionally to the acreage reductions in land reserves. In 1972, 230.9 million acres were planted to the seven major crops and 61.5 million acres were listed as idled by land reserve. In 1975 no land reserve provisions were operative, yet the increase in planted acreage of the seven major crops was only 31.0 million acres, or about half the acreage put into reserve in 1972. Commodity prices had substantially increased during this period, some to record levels, providing an added economic incentive for increased production.

These last two measures of slippage indicate that it is associated with total cropland as well as with individual crops. Use of land reserve has failed to remove a proportional acreage from crop production regardless of whether the consideration is for specific crops or crops in general.

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[5]See (*2*. p. 2) for breakdown of major land uses in the United States.

Slippage will vary by year, crop, and region, and it will also be affected by different programs. Knowledge of how land reserve provisions are applied and use of simple reasoning indicate that the acreage level of land reserve also affects the slippage coefficient. Slippage would be largest with small land reserve requirements and it would decrease as the total acreage of land reserve is increased. This statement follows simply because, if the land reserve requirement is large enough, a farmer would be forced to reduce acreage of major crops by 1 acre for each additional acre of land reserve. Slippage coefficients for individual crops are greater than coefficients for a group of crops or for cropland used for crops.

The empirical evidence available indicates that, on the average, past land reserve programs have been only 50 to 60 percent effective in reducing crop acreage from what that acreage would have been had no land reserve provisions existed. Relatively, wheat programs have resulted in more slippage than have feed grain programs. Shifting the concept of land reserve from diversion to set-aside increased the slippage problem.

Productivity of Land Reserves

A study of the productivity of diverted cropland published in 1969 concluded that the productivity of diverted acreage as a percentage of acreage in production reached 90 percent for wheat, 85 percent for grain sorghum, 83 percent for barley, 82 percent for corn, and 80 percent for cotton (*8*, pp. 14-15). This behavior constitutes a slippage factor in addition to the acreage slippage discussed above. Equation (2) illustrated a slippage concept that includes yield (productivity).

No studies were found that examined how nonparticipants adjust when participants maintain land reserve acres. Their behavior, if it follows that suggested earlier, would also affect slippage.

Reasons for Slippage

Why does slippage occur? A definitive answer would require careful study of annual program provisions and how these provisions apply on individual farms. Obvious observations can be made, however. Land normally not counted as part of the cropland inventory may qualify as land reserve acreage. In this case, available cropland acreage is not reduced proportionally, which allows crops other than those with acreage maximums to continue to be grown.

Many farms have land in the cropland inventory that is regularly left idle after planting. Fallow land is an obvious example but there are other situations, such as flooding, high water tables, alkaline soil conditions, small isolated tracts, and high incidence of crop failure in drought-ridden areas. Designation of land regularly idled anyway as land reserve will not affect final crop acreage. One reason a large slippage coefficient is associated with wheat is that land fallowed under normal circumstances has qualified as land reserve, resulting in no net effect on final wheat acreage.

BASES AND ALLOTMENTS AND PRODUCTION RIGIDITIES

Most U.S. farms have allotments, bases, or both, assigned to them depending on historical cropping patterns. To maintain the assigned level of the allotment or base, farmers have generally been required each year to maintain an acreage of the allotment or base crop that reaches at least 90 percent of the allotment or base. Most farmers have tried to maintain their allotment or base acreages because income supprt payments are directly related to these acreages.

The acreage of land to be idled under annual land reserve provisions has historically been calculated as a percentage of the particular base or allotment assigned to a farm. When marketing quotas are in effect, the allotment becomes the upper limit on acreage for the particular crop for all farmers. Under voluntary programs, only participating farmers are limited to planting within their allotment or base acreage.

The required planting provisions tended to lock in production patterns, which may have led to production inefficiencies as price relationships and technical possibilities changed over time. In 1964, substitution provisions for wheat and feed grains went into effect. These allowed farmers with both a wheat allotment and a feed grain base to plant either wheat or feed grains on both acreages, to "preserve production history." Farmers still had to plant within the total of the base and allotment if they were participants. The Agricultural Act of 1970 introduced the set-aside concept, which removed the upper acreage limits. In place of upper limits, set-aside relied only on the maintenance of the conserving base acres plus a set-aside land reserve as the production control mechanisms. Bases and allotments still had to be planted to specific crops or designated substitutes to "maintain production history." The Agriculture and Consumer Protection Act of 1973, which continued the set-aside concept, included cotton in the substitution provisions, and it also added a list of other crops that could be substituted. In comparison with past programs, the 1973 Act provided producers more freedom in decisionmaking as to the mix of crops that could be grown.

Conserving Base

The conserving base is yet another base assigned to farms, based on historical land use, that is important in understanding and evaluating land reserve programs. The conserving base applies to crops that conserve the soil as opposed to crops that deplete it. Although justified on the basis of soil conservation, the conserving base also acts as a program provision factor in production control. Typically, it reflects a historical acreage of fallow land, cropland pasture, tame hays and forages, soil improvement crops, and idle land.

Whenever land reserve provisions have been in effect, farmers have been required to maintain an acreage of soil-conserving crops equal to their assigned conserving land base, in addition to any land reserve acreage. The requirement to maintain the conserving base was instituted to prevent farmers from reducing conserving crops to meet land reserve requirements or, conversely, to prevent farmers from reducing conserving crops to maintain the acreage of major crops which were under production control.

As with other bases and allotments, use of the conserving base tended to lock in production patterns on farms, which could have caused production inefficiencies as price relationships and production techniques changed. This rigidity was recognized and conserving bases were reduced over time.

Sharples and Walker, as already noted in the study discussed above, reported a predictive equation for estimating the acreage of extensive crops (*5*, p. 109):

$Y_e = 25{,}167 + 26{,}828\ (0.9276)T - 0.124\ (DVRN)$

where: Y_e = planted acres (in thousands) of extensive crops[6]
T = time expressed as 1961 = 1, 1962 = 2, ... 1972 = 12
DVRN = wheat, feed grain, and cotton diverted acres (in thousands)

As shown by the equations, non-row crop acreage in the North Central region declined over time, mainly in hay and oats. Hay is a conserving base crop; oats may have been considered, historically, a conserving base crop, depending on how they were harvested locally. The shift from extensive to intensive crops, as measured by Sharples and Walker, parallels the reduction in the conserving base. Their equations illustrate another point in connection with slippage. Besides showing the slippage involved with land reserve acres for each year, the equations also indicate that a given level of land reserve in 1972 controlled intensive program crops less effectively than the same acreage had done in 1961. Further, the intensive crop equation, through the CFP variable, shows the effect of changing to the set-aside concept of land reserve in 1971. The land reserve acreage (DVRN) would have to be increased 2.0 million acres after 1970 (1.26 million ÷ 0.621) to offset the structural program shift.

In conclusion, there has not only been slippage for any given year but also a loss of effectiveness over time in the ability of land reserve acreage to control acreage of surplus production crops.

The use of substitute crop provisions, the shift to the set-aside concept, and the reduction in the conserving base have substantially reduced the production pattern rigidities imposed by the historical bases and allotments. Provisions to reduce the rigidity problem contributed to the slippage problem.

Comparison of Cropping Patterns with Bases and Allotments

Another problem with the historical bases and allotments is that income support payments, such as deficiency payments, are based on bases and allotments. Thus, a farmer can receive a payment based on a crop that is no longer a major crop nor one even grown on the farm. If the policymakers' intent is to associate payments with a particular crop (whether these payments are income support or compensation for production adjustment), relaxation of the association between a base and allotment and a particular crop could pose difficulties in administering a program, especially if the program is aimed at a particular crop.

The following table contains statements based on 1973 participant data that indicate the difference between cropping patterns and the assigned bases and allotments (*7*, pp. 168-169 and 264):

[6]Oats, wheat, barley, rye, flax, and tame hay.

Difference between cropping patterns and assigned bases and allotments

Corn	Farms with corn base had 77.0 million acres of base and planted 56.1 million acres of corn. 35 percent of the farms with corn base planted no corn. Those farms had 11.9 million acres of corn base. The corn base was overplanted by 200 percent or more on 3.3 percent of the farms. Those farms had 1.3 million acres of base and planted 3.8 million acres of corn.
Grain sorghum	Farms with grain sorghum base had 21.8 million acres of base and planted 14.9 million acres of grain sorghum. 48 percent of the farms with a grain sorghum base planted no grain sorghum. Those farms had 6.7 million acres of base. The grain sorghum base was overplanted by 200 percent or more on 7.1 percent of the farms. Those farms had 664,000 acres of base and planted 3.7 million acres of grain sorghum.
Barley	Farms with a barley base had 15.3 million acres of base and planted 7.9 million acres of barley. 67 percent of the farms with barley base planted no barley. Those farms had 6.9 million acres of base. The barley base was overplanted by 200 percent or more on 4.9 percent of the farms. Those farms had 530,000 acres of base and planted nearly 1.8 million acres of barley.
Wheat	Farms with domestic wheat allotment had 17.8 million acres of allotment (the domestic allotment is roughly one-third of the total wheat allotment) and planted 49.7 million acres of wheat. 45 percent of farms with wheat allotment planted no wheat. Those farms had 2.6 million acres of allotment. The wheat allotment was overplanted by 400 percent or over on 16.9 percent of the farms. Those farms had 3.8 million acres of domestic allotment and planted 21.4 million acres of wheat. (Farmers would normally overplant the domestic allotment by a factor of 3, if allotments and plantings were completely consistent.)
Cotton (based on 1972 data) (*6*, p. 437)	Farms with cotton allotment had 10.2 million acres of allotment and planted 13.8 million acres of cotton. Only 1.3 percent of farms with cotton allotment planted no cotton. Those farms had 31,000 acres of cotton allotment. The cotton allotment was overplanted by 200 percent or more on 9.2 percent of the farms. Those farms had 866,000 acres of allotment and planted 2.4 million acres of cotton.

A LAND RESERVE PROGRAM

If future supply and demand conditions require the use of land reserve to control supply, the problem of slippage will be encountered, should provisions be structured as they were during 1956-73. The rigidities involved in the use of historical bases and allotments have been reduced, but, as a consequence, base and allotments may no longer be related to production patterns that now exist on individual farms. A way to redefine crop bases and administer a land reserve is developed below. It attempts to reduce both the slippage and rigidity problem.

Assumptions

A voluntary land reserve program would be implemented annually, as needed, to selectively reduce the production of commodities that have a potential surplus. Land reserve provisions should be designed to minimize slippage and to maximize efficiency of production on nonreserve acres. Acres idled with minimum slippage would reflect a potential intermediate-term commodity reserve more accurately. The cost effectiveness would more nearly reflect the desired mix of production adjustment payments and income supplement payments (if any).

Crop bases are needed to establish a reference point for determining the level of land reserve required of each participant as a fair share of the total land reserve requirement. Bases may also be used for allocation of support payments.

This proposal modifies the procedure for setting historical bases and allotments and eliminates the conserving base. A farm's production pattern the previous year would be the base for making production adjustments in the current year. The production pattern for each farm would be reported annually by the farmer to the county Agricultural Stabilization and Conservation Service (ASCS) office.

If program administrators determined that a land reserve was needed, participating farmers would be required to limit their acreage of the specific crop to a certain percentage of their base. The base would be last year's acreage. In addition, participants would be required to certify an acreage of land reserve equal to the difference between the base acreage and the allowed planting. An upper acreage limit would be set as a percentage of the base and a percentage of the base would be devoted to the land reserve. The two percentages would add to 100.

A further requirement would be that the land reserve acreage be on land that had been planted to the controlled crop in the previous year. The crop base for a controlled crop for the next year would be the planted acreage plus the land reserve in the current year.

The proposed method of redefining crop bases does not relieve the program administrator of the task of determining the expected participation rate for the program announced. The base is last year's planted acreage, or planted acreage plus land reserve if a land reserve program had been in effect.

Obviously a high participation rate makes a program's effect more predictable. A low participation rate requires participants to make larger adjustments. It also makes the program effect harder to predict because of the adjustments nonparticipants may make in response to the program. Achieving higher voluntary participation rates requires greater economic incentives. Kinds and levels of incentives are not considered in this paper.

Examples

Six hypothetical farms are depicted in the figure to illustrate the method. Participants are required to limit corn acreage to 85 percent of their corn base and wheat acreage to 75 percent of their wheat base. Conversely, land reserve requirements are 15 and 25 percent of the corn and wheat bases, respectively.

Farmer A participates and puts 15 percent of the corn land into land reserve as required. A's corn base for year t+1 would be the same as for t. Farmer B participates and puts 25 percent of the wheat land in land reserve. The land reserve is placed on base wheat land and the acreage of wheat plus land reserve does not exceed the base acreage. An additional requirement that would logically be imposed is that a participating farmer such as B who did not have a corn base would not be able to grow corn in year t if corn production was also under production controls. B could grow a noncontrolled crop such as cotton (see figure), establishing a cotton base for year t+1. B could also grow corn if he were a nonparticipant. Wheat, soybeans, and cotton could be grown anywhere on B's farm.

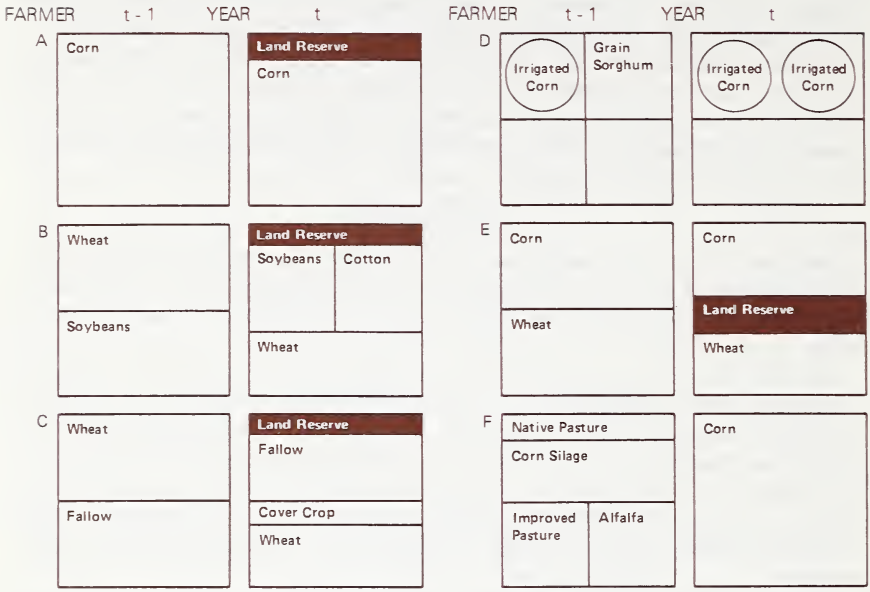
Farmer C operates a wheat-fallow rotation. If participating, C would be required to have a land reserve on the land in wheat in year t-1. C could not harvest an acreage of wheat plus land reserve in year t that would exceed the wheat base established in year t-1. The land fallowed in year t-1 would have to be planted to a cover crop in t. The cover crop might be wheat, but C would have to certify in some way that he did not harvest the cover crop portion; that is, clip the heads before they ripen or till the cover crop land before the wheat ripened.

Farmer D's corn base would equal one-fourth of the cropland based on his organization in t-1. Suppose D wanted to install another center-pivot irrigation system in order to double his corn acreage. By not participating in year t, D could expand his corn acreage and increase the base commensurate with the desired production plan. D could also eliminate wheat from the cropping plan and switch to grain sorghum. D reports year t organization to ASCS and he would be eligible to participate in any program in year t + 1. Under the existing base and allotment system, D would likely have a feed grain base, a wheat allotment, and a conserving base. These bases and allotments would no longer fit his desired organization. If participating in a program using the historical allotments and bases, D would either be forced to adjust his organization to conform more closely with the historical bases and allotments or else D would be receiving payments based on a crop he no longer grows. Under the method proposed here, D would be able to adjust his organization and bases by being a nonparticipant for 1 year at most. Or, if no production adjustment provisions had been in effect in year t, Farmer D could have adjusted bases without foregoing any possible benefits.

Another logical regulation would require a farmer growing two controlled crops (Farmer E) to either establish a land reserve for both crops or else not participate.

A farmer may desire to shift from a livestock operation, such as dairy farming, to a crop operation. Farmer F would likely have had a small feed grain base, a very large conserving base, and an acreage of tillable native pasture. In year t, F sells the herd and switches to a corn-for-grain organization. F could do this, report corn acreage, and establish a corn base for year t+1. F would be adding land to the cropland base.

HYPOTHETICAL FARMS USING PROPOSED LAND RESERVE PROGRAM



Evaluation

Such a method of setting bases and of controlling production through use of a land reserve should minimize interference with producer response to market signals. When needed, production control can be accomplished through a level of reserve in which the reduction base comes from the most recent level of resource allocation. Farmers always have the option of readjusting their production base to conform to their interpretation of market signals. They may have to forego program participation for 1 year but they incur no longrun penalty for making the adjustment, such as a permanent loss or reduction of an allotment or base.

Use of historical bases and allotments year after year has been justified as a way to channel benefits to farmers and to areas that had a cropping history and to prevent farmers with no production history from acquiring a base or allotment to share in the program benefits. A farmer may have desired to grow a program crop based on resulting payment benefits rather than on production efficiency and effective market demand. In such a case, the argument for historical bases and allotments has validity. An argument against annual adjustments of bases would be less compelling if policymakers were to take the view that farmers should rely on the marketplace for their income and that payments should be compensation for voluntarily making adjustments, including an amount for participation incentive.

Another point to consider is whether annual adjustment in bases would cause farmers to distort their production patterns to try to adjust their bases to their own advantage. Ideally, the fact that a current year's acreage will be the next year's base would not affect the production pattern. However, the identity between acreage and base will most probably influence production patterns. The degree of influence will depend on the benefits that go with a base. Production distortions should be minimal if a base is used for production adjustment and the payment is adequate compensation for the adjustment. Farmers would certainly try to maximize their base if large income transfers were tied to the base. Or they would try to minimize their base if required adjustments were not fully compensated. The structure of the entire program would help determine how well annual adjustments in bases might work.

An "n" year moving average could be used to adjust bases. The acreage from the most recent year is added and the acreage from the most distant year is dropped from the averaging equation. This procedure would make make base adjustments more gradual.

Reduction of slippage depends on inclusion of two requirements. Land reserve acreage must be allocated to land used to grow the crop in the previous year; and total acreage of the controlled crop must be limited. In one sense, these requirements introduce fairly rigid controls. Farmers would probably accept such measures only when their base acreages accurately reflected their desired organization.

CONCLUSIONS

Establishment of farm program bases, based on the previous year's organization, would be designed both to make production adjustments through land reserve more efficient by reducing slippage and also to minimize impediments to farmers who make desired organization adjustments. If most of the slippage could be eliminated from land reserve acres, these acres would be more representative of actual land reserve. Requiring land reserve acres to be on land actually used for the crop being adjusted in the previous year should assure that the productivity of these acres more nearly equals the cropped acreage than has been true in the past.

If large income supplements were to be tied to annually updated bases, there could be an incentive not to participate 1 year in order to establish a large base. This possibility would have to be considered. But it may be less of a problem if income supplements were to vary from year to year as they do under the current program, which involves deficiency payments. If payments were to vary, farmers would have to gamble that they would be large the year(s) following their adjustments. The expected payoff of obtaining a larger allotment may not be enough to justify foregoing a year's program benefits unless market expectations also indicate a need for adjustment of crop acreages.

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REFERENCES

(1) Ericksen, Milton H. and James W. Richardson. Unpublished research. Econ. Res. Serv., U.S. Dept. Agr., and Okla. State Univ., Stillwater, 1975.

(2) Frey, H. Thomas. Major Uses of Land in the United States, Summary for 1969. Agr. Econ. Rpt. 247, Econ. Res. Serv., U.S. Dept. Agr., Dec. 1973.

(3) Garst, Gail D. and Thomas A. Miller. "Impact of the Set-Aside Program on the U.S. Wheat Acreages," *Agr. Econ. Res.* Vol. 27, No. 2, Apr. 1975, pp. 30-37.

(4) Houck, J. P. and M. E. Ryan. "Supply Analysis for Corn in The United States: The Impact of Changing Government Programs,"*Am. J. Agr. Econ.* Vol. 54, No. 2, May 1972, pp. 184-191.

(5) Sharples, Jerry A. and Rodney Walker. "Shifts in Cropland Use in the North Central Region," *Agr. Econ. Res.* Vol. 26, No. 4, Oct. 1974, pp. 106-111.

(6) U.S. Department of Agriculture. An Analysis of the 1972 Set-Aside Programs. Agr. Stabiliz. and Conserv. Serv., Data Systems Div., Jan. 1973.

(7) U.S. Department of Agriculture. Frequency Distributions of Participating Farms in 1973 Feed Grain, Wheat, and Cotton Set-Aside Programs. Data Systems Div., Agr. Stabiliz. and Conserv. Serv., Apr. 1974.

(8) Weisgerber, P. Productivity of Diverted Cropland. Econ. Res. Serv. 398, Econ. Res. Serv., U.S. Dept. Agr., Apr. 1969.